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मानक

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“The Right to Information, The Right to Live”

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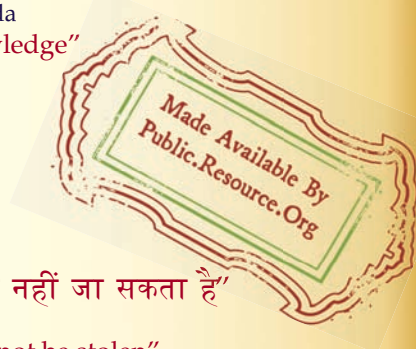
IS 7079 (2008): Automotive vehicles - Brake hose assemblies for hydraulic braking systems used with non-petroleum base brake fluid [TED 4: Automotive Braking Systems]



“ज्ञान से एक नये भारत का निर्माण”

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“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

स्वचल वाहन — गैर पेट्रोलियम बेस ब्रेक तरल के साथ
प्रयुक्त द्रवचालित ब्रेकिंग पद्धति के हेतु ब्रेक हौज़ असेम्बली —

विशिष्ट

(तीसरा पुनरीक्षण)

Indian Standard

AUTOMOTIVE VEHICLES — BRAKE HOSE
ASSEMBLIES FOR HYDRAULIC BRAKING SYSTEMS USED
WITH NON-PETROLEUM BASE BRAKE FLUID —
SPECIFICATION

(*Third Revision*)

ICS 43.040.40

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Braking Systems, Vehicle Testing and Performance Evaluation Sectional Committee had been approved by the Transport Engineering Division Council.

This standard was first published in 1973 and subsequently revised in 1979 and 1995. The revision of this standard has been taken up to align in line with other International Standards.

In the formulation of this standard, considerable assistance has been derived from the following:

ISO 3996 : 1995 (E) 'Road vehicles — Brake hose assemblies for hydraulic braking systems used with a non-petroleum base hydraulic fluid', issued by the International Organization for Standardization.

ASTM Designation : D571 — 55 'Standard method of testing automotive hydraulic brake hose', issued by American Society for Testing and Materials, USA.

SAE J1401 : 2003 'Road vehicle — Hydraulic brake hose assemblies for use with non-petroleum base hydraulic fluid', issued by the Society of Automotive Engineers, USA.

The purpose of this standard is to reduce the probability of accidents occurring as a result of brake system failure from pressure loss due to hose rupture.

The composition of the Committee responsible for the formulation of this standard is given at Annex J.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 SEPTEMBER 2011
TO
IS 7079 : 2008 AUTOMOTIVE VEHICLES —
BRAKE HOSE ASSEMBLIES FOR HYDRAULIC BRAKING
SYSTEMS USED WITH NON-PETROLEUM BASE
BRAKE FLUID — SPECIFICATION

(Third Revision)

(Second cover page, Foreword, para 2) — Add following para after para 2:

‘For extending approval as per IS 7079 : 1995 to approval as per IS 7079 : 2008, only the following verification/tests need be carried out:

- a) Expansion test at 20 MPa pressure as per **5.5**,
- b) Static Ozone Resistance Test as per **5.13**,
- c) Dynamic Ozone Resistance Test as per **5.14**,
- d) Hot Impulse Strength Test as per **5.15**,
- e) Brake Fluid Compatibility Test as per **5.16**, and
- f) HL or HR marking as per **7.1**.’

(Second cover page, Foreword, para 5) — Substitute ‘Annex K’ for ‘Annex J’

(Page 1, clause 1.1) — Substitute the following for the existing:

‘1.1 This standard specifies the performance requirements, test procedures and methods of sampling of brake hose assemblies to be used in hydraulic braking systems of automotive vehicles having nominal internal diameter upto 5 mm.’

(Page 1, clause 3.11) — Add following new clause after 3.11:

‘3.12 Type of Brake Hose Assembly

Brake hose assemblies which do not differ in the details of following parameters are considered as same type of brake hose assembly:

- i) Brake hose construction,
- ii) Material, and
- iii) Fitting crimp or swage area.

Price Group 2

Amend No. 1 to IS 7079 : 2008

Changes in parameters, which do not influence the integrity of the hose coupling joints, such as the following do not constitute a different type:

- i) Length;
- ii) End fitting shape, thread size, port dimensions, hexagon size; and
- iii) External appendage such as protective sleeve, armour spring, centre fitting.'

(Page 2, clauses **4.1.1** and **4.1.2**) — Substitute the following for the existing:

‘4.1.1 Lining

The lining shall consist of a suitable material (such as rubber compound, Teflon etc.) resistant to non-mineral oil based brake fluid.

4.1.2 Reinforcement

The reinforcement shall consist of suitable material such as textile (cotton, viscose rayon, polyester fibre or any other suitable synthetic fibre or a combination of these) or metallic wire or combination thereof etc.'

(Page 2, clause **4.2.1**) — Insert the following at the end of clause:

‘These conditions are deemed to be satisfied, if the requirements of **5.4** are complied with.’

(Page 2, clause **4.2.2**, second sentence) — Substitute ‘There shall be at least two reinforcement plies and the same shall be impregnated with a suitable compound.’ for ‘There shall be at least two reinforcement plies and the same shall be impregnated with a suitable rubber compound.’

(Page 2, clause **5.1**, last para) — Substitute the following for the existing:

‘Further, in case the hose length is more than what required for tests, shorter hose length shall be prepared for such tests. Hose assembly configuration is such that it is impractical to conduct any of the tests, hose assemblies produced with straight end fittings shall be used as substitute brake hose assemblies for such tests.’

Amend No. 1 to IS 7079 : 2008

(Page 2, clause 5.2.1.1) — Substitute the following for the existing:

‘5.2.1.1 Criteria for approval

Fifteen samples shall be submitted for testing along with the relevant data. These samples shall be tested in the sequence given in Table 1.

The test schedule shall consist of all the tests listed in Table 1. The complete test schedule shall be conducted for each type of brake hose assembly.’

[Page 3, Table 1, Sl No. (ii)] — Substitute ‘Constriction’ for ‘Construction’

(Page 3, Table 1) — Add the following Note at end of table:

‘NOTE — Tests on samples 3, 4 and 5 (Bursting strength, whip test and tensile tests) need not be carried out if the condition prescribed in 5.7, 5.8 and 5.9 are satisfied.’

(Page 4, clause 5.7) — Delete the NOTE given below 5.7.

(Page 4, clause 5.7) — Add the following at the end of the clause:

‘This test need not be carried out if it has been carried out as part of tests described in 5.10 or 5.16.

(Page 4, clauses 5.8 and 5.9) — Add the following at the end of both the clauses:

‘This test need not be carried out if it has been carried out as part of test described in 5.10.’

(Page 4, clause 5.10) — Add the following Note at the end of the clause:

‘NOTE — This test is applicable only when the material for hose is a compound of rubber.’

(Page 5, clause 6.1.1) — Substitute the following for the existing:

‘6.1.1 Lot

In any consignment, the lengths of assembled brake hose needed for carrying out inspection or tests, of the same type, size and diameter, having the same number of plies, produced under essentially similar conditions of manufacture (such as

Amend No. 1 to IS 7079 : 2008

those from single batch of raw material or from components obtained from a single source or from a single production method or undergoing a single curing process) shall be separated into groups and each such group shall constitute a separate lot.'

(Page 6, clause 7.1, first sentence) — Substitute the following for the existing:

'Each brake hose assembly (*see* 3.1) shall be legibly and indelibly marked with the following:'

(Page 6, clause 7.2) — Insert following new clauses after 7.2:

'8 TYPE APPROVAL FOR STATUTORY CERTIFICATION

If the tests are carried out for the purpose of statutory certification, the test authority shall issue a type approval certificate if the brake hoses are found to comply with the requirements of test given in 5.2.1.

8.1 Technical Information to be Submitted by the Applicant

The applicant shall submit the technical specification of the brake hose assembly contained in Annex J to the test agency for the purpose of statutory certification.

8.1.1 Every modification pertaining to the information, even if the changes are not technical in nature declared in accordance with 8.1 shall be intimated by the manufacturer to the certifying agency.

If the changes in parameters are not related to the provisions, no further action need be taken.

If the changes in parameters are related to the tests, the Test Agency, which has issued the certificate of compliance, shall then consider, whether:

- i) the brake hose assembly with the changed specifications still complies with provisions,
- or
- ii) Any further verification is required to establish compliance.

8.2 Criteria for Extension of Approval

For considering whether testing is required or not, guidelines given in Table 7 shall be used. Changes other than those listed in Table 7 shall not be considered to affect the performance of brake hose adversely.

Table 7 Criteria for Extension of Approval
(Clause 8.2)

Sl No.	Parameter and Change	Tests to be Conducted
1.	Change of material of hose or type of braiding	Burst test and whip test to be conducted
2.	Change in the crimping or swaging area	Whip test to be conducted
3.	Section dimensions of the hose	Burst test and whip test to be conducted
4.	Change in bore diameter	All tests except salt spray test
5.	End fittings	Salt spray test need not be carried out if the manufacturer can show evidence that the corrosion protection is same. In case the braiding material is changed to metallic other than stainless steel, salt spray test shall be carried out.

NOTE — Changes other than above shall not call for re-testing of the Brake Hose Assembly.

8.2.1 In case of fulfillment of criterion **8.1.1(i)** or after results of further verification as per **8.1.1(ii)** are satisfactory, the approval of compliance shall be extended for the changes carried out.

8.3 Conformity of Production (COP)

The frequency for carrying out check/tests by test agency shall be once in two years. Tests applicable for the purpose of COP, shall be those listed in **5.2.3.**

(Page 6, clause 8) — Renumber the existing clause as **9**.

(Page 13, Annex H) — Add the following new Annex J at the end:

‘ANNEX J

**INFORMATION TO BE SUBMITTED AT THE TIME OF
APPLICATION FOR APPROVAL, IF REQUIRED FOR STATUTORY
PURPOSES**
(Clause 8.1)

J-1	Trade name or mark of the brake hose assembly:
J-2	Manufacturer's name and address:
J-3	Telephone No:
J-4	FAX. No:
J-5	E mail address:
J-6	Contact person:
J-7	If applicable, name and address of manufacturer's representative:
J-8	Nominal internal diameter:
J-9	Length:
J-10	Material of lining (for example, rubber compound, Teflon etc):
J-11	The material of reinforcement (Textile/metal wire/comboination thereof):
J-11.1	If textile, type of material (cotton/viscose rayon/polyester fibre/ other synthetic fibre):
J-11.2	If metal, wire material (stainless steel/other):
J-12	Material of end connection:
J-13	Surface treatment for the end connection:
J-14.0	Crimping details:
J-14.1	Method:
J-14.2	Length:
J-14.3	Diameter:
J-14.4	Location of Markings on brake hose assembly:
NOTE — Information regarding J-8 to J-14.4 may be given in a drawing.	

(Page 15, Annex J) — Substitute ‘Annex K’ for ‘Annex J’.

(TED 4)

Indian Standard

AUTOMOTIVE VEHICLES — BRAKE HOSE ASSEMBLIES FOR HYDRAULIC BRAKING SYSTEMS USED WITH NON-PETROLEUM BASE BRAKE FLUID — SPECIFICATION

(*Third Revision*)

1 SCOPE

1.1 This standard specifies the performance requirements, test procedures and methods of sampling of brake hose assemblies to be used in hydraulic braking systems of automotive vehicles having nominal internal diameter:

- a) 3.5 mm or less, and
- b) 4-5 mm.

1.2 It applies to brake hose assemblies made of a hose fabricated from cord and natural or synthetic elastomers and assembled with metal end fittings for use with non-petroleum-base brake fluids in accordance with IS 8654. The hose assemblies may also have metal centre fittings, rubber grommets, spring guards or any other protective parts.

1.3 This standard does not cover requirements for the end fittings, centre fittings; protective parts, etc, except for salt spray test (*see 5.11*).

2 REFERENCES

The following standards contain provisions, which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
3400 (Part 20) : 1994	Methods of test for vulcanized rubbers: Part 20 Resistance to ozone cracking — Static strain test (<i>first revision</i>)
8654 : 2001	Automotive hydraulic brake fluid, heavy duty (<i>first revision</i>)

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Brake Hose Assembly — Brake hose equipped with end fittings for use in a brake system.

3.2 Brake Hose — A flexible conduit used in a braking system to transmit and contain the fluid pressure to apply force to the vehicle's brakes.

3.3 Fittings

3.3.1 End Fittings — A coupler designed for permanent attachment to the ends of a brake hose assembly by crimping or swaging.

3.3.2 Centre Fittings — A coupler designed for anchoring at an intermediate position of the brake hose assembly by crimping or swaging.

3.4 Free Length — The linear measurement of brake hose between the end fittings of a brake hose assembly in straight position.

3.5 Leaks, Burst — The loss of test fluid through the brake hose assembly other than the designed inlet(s) and outlet(s).

3.6 Cracking — The interruption on a surface due to environment and/or stress.

3.7 Hose Expansion

3.7.1 Low Expansion Hose — The hose assemblies having expansion values as per the Table 3 of this standard are Low expansion hose.

3.7.2 Regular Expansion Hose — The hose assemblies having expansion values as per the Table 4 of this standard are Regular expansion hose.

3.8 Hose Internal Diameter — A dimensional description of the nominal inside diameter that is printed on the hose cover. This dimension is to be used to calculate the gauge size for the constriction test.

3.9 Type Tests — Tests carried out to prove conformity with this standard. These are intended to prove the general qualities and design of a given type of brake hose.

3.10 Acceptance Tests — Tests carried out on sample(s) taken from a lot for the purpose of acceptance of the lot.

3.11 Routine Tests — Tests carried out on each brake hose to check conformance to requirements on parameters which are likely to vary during production.

4 REQUIREMENTS

4.1 Materials

4.1.1 Lining

The lining shall consist of a suitable rubber compound, resistance to non-mineral oil based brake fluids.

4.1.2 Reinforcement

The textile reinforcement shall consist of cotton, viscose rayon, polyester fibre or any other suitable synthetic fibre or a combination of these.

4.1.3 Cover

The cover shall consist of suitable synthetic rubber compound resistance to ozone and weathering conditions.

4.1.4 In case of assembled hose the exposed steel end connections of the hose assembly shall be plated with zinc, tin or cadmium for protection against corrosion.

4.2 Construction

4.2.1 Lining

The lining shall be reasonably uniform in thickness, concentric and free from air blisters, porosity and any other visible defects. It shall be seamless and as smooth in the bore as is consistent with good manufacturing practice.

4.2.2 Reinforcement and Reinforcement Plies

The reinforcement shall be firmly and evenly braided over the lining. There shall be at least two reinforcement plies and the same shall be impregnated with a suitable rubber compound. A cushion liner between the reinforcement plies is permitted.

4.2.3 Cover

The cover shall be reasonably uniform in thickness, concentric and free from air blisters, porosity and splits.

5 TESTS

5.1 Test Conditions

The hose assemblies for the tests shall be new and unused. They shall be at least 24 h old. For the last 4 h prior to testing, they shall be maintained at a temperature of 15° to 32°C. Unless otherwise specified, the temperature of the test room shall be between 15° to 32°C for all tests.

Prior to installation of the hose assembly for a whip test or cold bend test, all external appendages such as mounting brackets, spring guards and metal collars shall be removed.

Further, in case the hose length is more than what required for tests, shorter hose length shall be prepared for such tests. Hose assembly configurations are such that it is impractical to conduct tests such as tensile,

whip and constriction, hose assemblies produced with straight end fittings made from equivalent, production type equipment and processes shall be used as substitute brake hose assemblies for such tests.

5.2 Classification of Tests

5.2.1 Type Tests

The following shall constitute type tests:

- a) Visual examination (*see 5.3*),
- b) Constriction test (*see 5.4*),
- c) Expansion test (*see 5.5*),
- d) Pressure test (*see 5.6*),
- e) Bursting strength test (*see 5.7*),
- f) Whip test (*see 5.8*),
- g) Tensile test (*see 5.9*),
- h) Water absorption test (*see 5.10*),
- j) Salt spray test (*see 5.11*),
- k) Cold bend test (*see 5.12*),
- m) Static Ozone resistance test (*see 5.13*),
- n) Dynamic Ozone resistance test (*see 5.14*),
- p) Hot Impulse Strength test (*see 5.15*), and
- q) Brake fluid compatibility test (*see 5.16*).

5.2.1.1 Criteria for approval

Fifteen samples shall be submitted for testing along with the relevant data. These samples shall be tested in the sequence given in Table 1. The testing authority shall issue a type approval certificate if the brake hoses are found to comply with the requirements of tests given in 5.2.1.

The test schedule shall consist of all the tests listed in Table 1. The complete test schedule shall be conducted for each separate brake hose assembly design. Any changes in hose construction or materials, fitting crimp area or swage area design shall be deemed to constitute a change in assembly design.

Variations that do not influence the integrity of the hose coupling joint such as change in length, end fitting shape, thread size, port dimensions, hexagon size and external appendage such as protective sleeve, armour spring, center fitting, shall not be considered as hose design change.

5.2.1.2 In case of failure in one or more requirements, testing authority may, at its discretion, call for fresh samples not exceeding twice the number of original samples and subjects them to test(s) in which failure occurred. If in repeat test(s) no failure occurs, the samples shall be deemed to comply with the requirements of this standard.

Table 1 Sequence of Tests for Type Approval
(Clause 5.2.1.1)

Sl No.	Tests (No. of Samples)	Sequence													
		1	2	3	4	5	6-8	9	10	11	12	13	14	15	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
i)	Visual examination	X	X	X	X	X	X	X	X	X	X	X	X	X	
ii)	Construction test	X	X	X	X	X	X	X	X	X	X	X	X	X	
iii)	Expansion test	X													
iv)	Pressure test		X												
v)	Bursting strength test			X											
vi)	Whip test				X										
vii)	Tensile test					X									
viii)	Water absorption test (one each for Burst, whip and Tensile)						X	X							
ix)	Salt spray test								X						
x)	Cold bend test									X					
xi)	Static Ozone resistance test										X				
xii)	Dynamic Ozone resistance test											X			
xiii)	Hot Impulse Strength test												X		
xiv)	Brake fluid compatibility test													X	

5.2.2 Acceptance Tests

The following shall constitute acceptance tests:

- Visual test (see 5.3),
- Constriction test (see 5.4),
- Expansion test (see 5.5),
- Pressure test (see 5.6),
- Bursting strength test (see 5.7),
- Whip test (see 5.8),
- Tensile test (see 5.9),
- Water absorption test (see 5.10), and
- Brake fluid compatibility (see 5.16) (Optional).

5.2.2.1 A recommended sampling plan is given in 6.

5.2.3 Routine Tests

The following shall constitute routine tests:

- Visual test (see 5.3),
- Constriction test (see 5.4) or any other equivalent test, and
- Pressure test (see 5.6).

5.3 Visual Test

All hoses shall be visually examined for defects such as air blisters, porosity that affects the performance of the hose and shall be free from these surface defects.

5.4 Constriction Test

5.4.1 The constriction of the hose assembly shall be measured with gauge plug as given in Annex A. The time required for the gauge plug to drop its own mass at a distance of 75 mm into the hose assembly shall not exceed 5 s.

5.4.2 Some hose assemblies have a fitting so designed that it is impossible to insert the gauge externally. For these hose assemblies, insert a special elongated gauge plug that meets the requirements of Annex A, with the exception of the length, which shall be such that its tip will extend past the hose opening, into the opposite end.

NOTES

1 If the gauge plug becomes misaligned at the entrance to the second fittings, it may be necessary to align the hose to allow the gauge plug to pass through.

2 Some hose assemblies have fittings on both ends which cannot be entered with the gauge plug. Cut these hose assemblies 50 ± 2 mm from the end of the fitting and then test with the gauge plug in accordance with Annex A.

5.5 Expansion Test

The maximum volumetric expansion of any the hose assemblies, when subjected to internal hydraulic pressure of 6.9 MPa, 10.3 MPa and 20.0 MPa (1 MPa = 10.2 kgf/cm^2) and tested according to the method specified in Annex B, shall not exceed the values given in Table 2 for low expansion hose and Table 3 for regular expansion hose.

**Table 2 Maximum Expansion of Free Length
Hose — Low Expansion Hose (cm³/m)
(Clause 5.5)**

Sl No.	Nominal Bore Size mm	Internal Hydraulic Pressure		
		6.9 MPa	10.3 MPa	20.0 MPa
(1)	(2)	(3)	(4)	(5)
i)	3.5 or less	1.08	1.38	2.00
ii)	4 to 5	1.81	2.36	3.00

**Table 3 Maximum Expansion of Free Length
Hose — Regular Expansion Hose (cm³/m)
(Clauses 3.7.1 and 5.5)**

Sl No.	Nominal Bore Size mm	Internal Hydraulic Pressure		
		6.9 MPa	10.3 MPa	20.0 MPa
(1)	(2)	(3)	(4)	(5)
i)	3.5 or less	2.17	2.59	4.00
ii)	4 to 5	2.87	3.35	5.50

5.6 Pressure Test

Prior to dispatch each complete hose assembly shall be subjected to a pressure test using inert gas, air, water or brake fluid conforming to IS 8654 as the pressure medium. The test pressure shall be between 10.3 MPa and 14.5 MPa for inert gas and air, and between 20.7 MPa and 24.8 MPa for water and brake fluid. The pressure shall be held between 10 s and 25 s and hose assembly showing leaks during this test shall be rejected and destroyed.

WARNING — Special care shall be taken when gas or air is used, as under the pressure specified, gas and air are explosive if a failure should occur in the hose assembly.

5.7 Bursting Strength Test

When tested at the hydraulic pressure specified in the method given in Annex C, each sample of hose and hose assembly shall withstand the specified pressure for 2 min and shall withstand the minimum burst pressure as given in Table 4.

NOTE — Special care shall be taken if air is used, as under the pressure specified, air is explosive in case a failure occurs in the hose or hose assembly.

**Table 4 Hold Pressure and Minimum Bursting
Pressure Strength
(Clauses 3.7.2, 5.7, 5.16 and C-2)**

Sl No.	Bore Size mm	Retention Pressure MPa	Bursting Pressure, Min MPa
(1)	(2)	(3)	(4)
i)	3.5 or less	27.6	49.0
ii)	4 to 5	27.6	34.5

5.8 Whip Test

The minimum life of any one of the sample hose assemblies when tested in accordance with Annex D with free length ranging from 200 to 600 mm for 3.5 mm or less bore and 200 to 400 mm for 4 to 5 mm bore hoses, run continuously on the flexing machine, shall be 35 h.

NOTE — If the hose assembly is longer than the above specified length, use the max length indicated in the respective category of col 2 of Table 6.

5.9 Tensile Test

The hose assembly shall be fixed in the testing machine and pulled at any one of the speed as indicated in Table 5. The hose assemblies so tested shall withstand a minimum load listed in Table 5 without the end fittings pulling off or rupture of the hose. Any tensile testing machine capable of recording up to 500 kg of tension may be used. This test shall be carried out between 15° and 32° C.

Table 5 Tensile Separation Rate and Minimum Load

Sl No.	Bore Size mm	Separation Rate mm/min	Minimum Load N
(1)	(2)	(3)	(4)
i)	All	25 ± 3	1 446
ii)	All	50 ± 3	1 646

5.10 Water Absorption Test

Immerse the brake hose assemblies in water at 85 ± 2°C for a period of 70 to 72 h. Carry out burst and tensile test on this hose within 10 min of removal from the water and start the whip test within 10 to 30 min after removing the hose assemblies from the water. The hose shall pass all these tests.

5.11 Salt Spray Test

The hose assembly and end connections shall be capable of withstanding 24 h of exposure to salt spray without evidence of rust or corrosion when tested in accordance with Annex E.

5.12 Cold Bend Test

Condition the hose assemblies in straight position in a cold box maintained at -45 to -48°C for 70 to 72 h. After conditioning and without removal from the cold box, the hose shall be bent around a mandrel having a diameter of 76.2 to 77.2 mm for 3.5 mm or less hose and 88.9 to 89.9 mm for 4 to 5 mm hose. The hose shall not crack (visible without magnification) or break.

5.13 Static Ozone Resistance Test

The hose shall be bent around a mandrel having diameter equal to eight times the nominal outside diameter of the hose and it shall be exposed to ozone concentration of 100 ± 5 parts per hundred million (pphm) by volume for 70 to 72 h in accordance with

IS 3400 (Part 20). The outer cover of the hose shall show no cracking when examined under 7 power magnification, ignoring the areas immediately adjacent to, or within, the area covered by the binding (that is area where hose tied up with mandrel).

5.14 Dynamic Ozone Resistance Test

The outer cover of the hose shall not show cracks visible to the naked eye without magnification when tested in accordance with Annex F at the worst stress condition, ignoring the areas immediately adjacent to or within the area covered by the band clamps.

5.15 Hot Impulse Strength Test

The test shall be carried out as per the procedure given in Annex G. After having withstood impulsing for 150 cycles without leakage, a brake hose assembly shall withstand a 2 min pressure hold at 27.6 MPa without leakage and shall not burst at a pressure less than 34.5 MPa.

NOTE—This test is optional for two wheeler hose assemblies as two wheeler hoses are not exposed to high temperatures like four wheeler hoses fitted in hood.

5.16 Brake Fluid Compatibility Test

The test shall be carried out as per the procedure given in Annex H after subjecting the hose filled with the brake fluid conforming to IS 8654 to a temperature of 120 to 125°C for 70 to 72 h.

The brake hose assembly shall meet the constriction test requirements as specified in 5.4. It shall then withstand the retention pressure and burst pressure requirements as specified in Table 4 (*see* 5.7).

6 SAMPLING

6.1 Scale of Sampling

6.1.1 Lot

In any consignment, all the lengths of assembled brake hose of the same type, size and diameter, having the same number of plies, produced under essentially similar conditions of manufacture (such as those from single batch of raw material or from components obtained from a single source or from a single production method or undergoing a single curing process) shall be separated into groups and each such group shall constitute a lot.

6.1.2 Tests for the determination of the conformity of lot to the requirements of this standard on assembled brake hoses shall be carried out for each lot separately. The number of lengths of assembled hoses to be selected for this purpose shall be in accordance with col 2 and col 3 of Table 6.

6.1.3 The required number of lengths of assembled hoses shall be selected at random from the lot. For this purpose, a suitable number of bundles in the lot shall be chosen first and from each of the bundles so chosen not more than 5 lengths shall be taken out of random so as to obtain the desired numbers indicated in col 3 of Table 6.

Table 6 Scale of Sampling
(Clauses 6.1.2, 6.1.3 and 6.2.1.1)

SI No.	Lot size (In Lengths)	Sample size (In Lengths)	Permissible Number of Defective Lengths
(1)	(2)	(3)	(4)
i)	Up to 1 000	25	1
ii)	1 001 to 1 500	35	1
iii)	1 501 and above	50	2

6.2 Tests for Characteristics Requiring Non-Destructive Testing

6.2.1 Hose lengths selected according to 6.1.3 shall be inspected visually for defects like air blister, porosity and other surface defects. Each length shall also be subjected to: (a) constriction test (*see* 5.4), (b) expansion test (*see* 5.5), and (c) pressure test (*see* 5.6). Each length shall be measured for free length (that is, distance between couplings). Any length found unsatisfactory with records to one or more of these characteristics shall be considered as defective.

6.2.1.1 If the number of defective lengths is greater than the corresponding number of permissible defective lengths given in col 4 Table 6 the lot shall be rejected.

6.3 Tests for Characteristics Requiring Destructive Testing

6.3.1 Burst Test, Whip Test, Tensile Test and Water Absorption Test

From each of the lots which are found to be satisfactory according to 6.2.1.1 one length of assembled brake hoses for each lot containing more than 1 500 lengths or less and two lengths of assembled brake hoses for each lot containing more than 1 500 lengths, shall be chosen at random from those already selected (*see* 6.1.3) for carrying out each of these tests.

6.3.1.1 The lot shall be declared as conforming to the requirements of this standard if the test results for the determination of different characteristics are found satisfactory. In case test results for any characteristic fail to meet the relevant requirement of this standard, two more tests for each lot containing 1 500 lengths or less and four more tests for each lot containing more than 1 500 lengths, shall be conducted for that characteristic and only on finding all these tests satisfactory, the lot shall be considered to the requirements of that characteristic; otherwise not.

6.3.2 Brake Fluid Compatibility Test

One length of assembled brake hose shall be selected at random from lots already selected (*see* 6.1.3) and found satisfactory (*see* 6.2.1.1) for carrying out the test.

6.3.2.1 The lot shall be declared as conforming to the requirements of the specification, if test result is found

satisfactory. In case the test result for the characteristics fail to meet the relevant requirement of the specification, two more tests shall be conducted on two different lengths of hoses chosen from the lot and only on finding these two tests satisfactory, the lot shall be considered as confirming to the requirements otherwise not.

NOTE—This is an optional test and it shall be carried out, if required by the purchaser.

7 MARKING

7.1 Each length of the hose shall be legibly and indelibly marked with the following:

- Manufacturer's name or trade-mark, if any;
- Hose denomination;
- Batch number or date code;

- Month and year of manufacture;
- HL marking for low expansion hose; and
- HR marking for regular expansion hose

7.2 BIS Certification Marking

The product may also be marked with Standard Mark.

7.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of Standard Mark may be granted to the manufacturers or producers may be obtained from the Bureau of Indian Standards.

8 PACKING

The hoses shall be packed in the manner as agreed to between the manufacturer and the purchaser.

ANNEX A

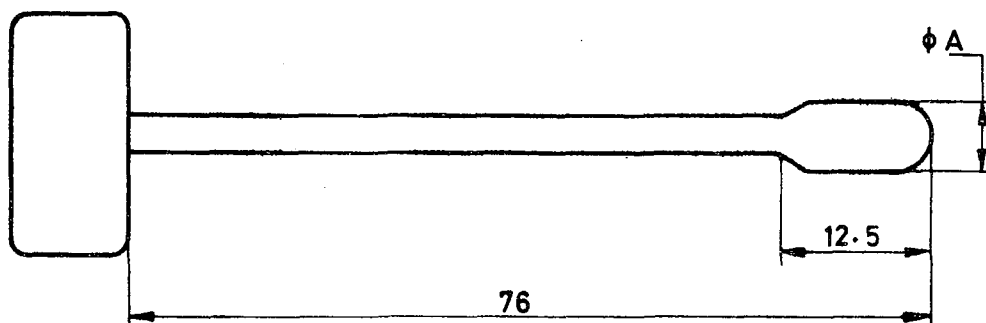
(Clauses 5.4.1 and 5.4.2)

METHOD FOR CONSTRICTION TEST

A-1 PROCEDURE

A-1.1 Constriction of the bore of the hose ends after swaging shall be measured with a gauge plug as shown in Fig. 1. The mass of the gauge plug shall be 57 ± 3 g and diameter A shall be 64 percent, minimum of nominal internal diameter of the hose.

A-1.2 The hose ends shall be held in a vertical position and the 'A' dia portion shall be inserted into the threaded end. The gauge shall be permitted to drop on its own mass at a distance of 75 mm through the hose end. The time required to drop 75 mm shall not exceed 5 s. The diameter of the plug at 'A' for various bore sizes shall be as shown in Fig. 1.



All dimensions in millimetres.

FIG. 1 GAUGE PLUG FOR TESTING CONSTRICTION OF BORE OF HOSE

ANNEX B

(Clauses 5.5 and C-2)

METHOD FOR EXPANSION TEST

B-0 GENERAL

The expansion test shall be designed to measure the volumetric expansion of the free length of assembled hydraulic brake hose by fluid displacement when subjected to specified internal pressures.

B-1 APPARATUS

B-1.1 The test apparatus shall consist essentially of suitable source for required fluid pressure, pressure gauge, piping, valves, fittings in which the hose assembly may be mounted in a vertical position for application of pressure under controlled conditions and a graduated burette for measuring the volume of liquid corresponding to the expansion of the hose under pressure. All piping and connections shall have smooth bore without recesses or offsets, so that all air may be freely removed from the system before carrying out each test. The valves shall be of such design as to open and close with minimum displacement liquid. The apparatus shall be capable of applying the pressure at a rate of increase of 175 ± 70 MPa/min. A suitable apparatus is illustrated in Fig. 2. Alternative apparatus having the same functional characteristics also can be used with the latest technology (that is with computerized electronic transducers, etc).

B-1.2 Calibration of Apparatus

Prior to use the apparatus shall be tested to determine its calibration correction factor. For this purpose 6.35 mm diameter soft seamless steel tubing or its equivalent shall be used in place of the hose assembly. Calibration correction factors shall be established at the pressure of 10.5 MPa and they shall be subtracted from the expansion readings obtained on the test specimen. The maximum permissible calibration correction factor shall be 0.08 ml at 10.5 MPa.

B-2 PROCEDURE

Carefully thread the test specimen into position on the apparatus in such a way as to provide a leak proof seal by taking care to avoid twisting and to maintain the hose in a vertical position without tension while under pressure. Fill the tank *C* with distilled water by taking care that it is free from air or dissolved gases. Open valve *B* and turn crank *D* to the left to allow the maximum amount of water to flow into the master cylinder. Next open valves *E*, *F* and *G*, allowing the water to run from *C* through burette. Removal of air bubbles may be facilitated by moving the hose back and forth. Close valves *B* and *F* and raise the pressure in the hose to 10.5 MPa for not more than 10 s. After inspecting for

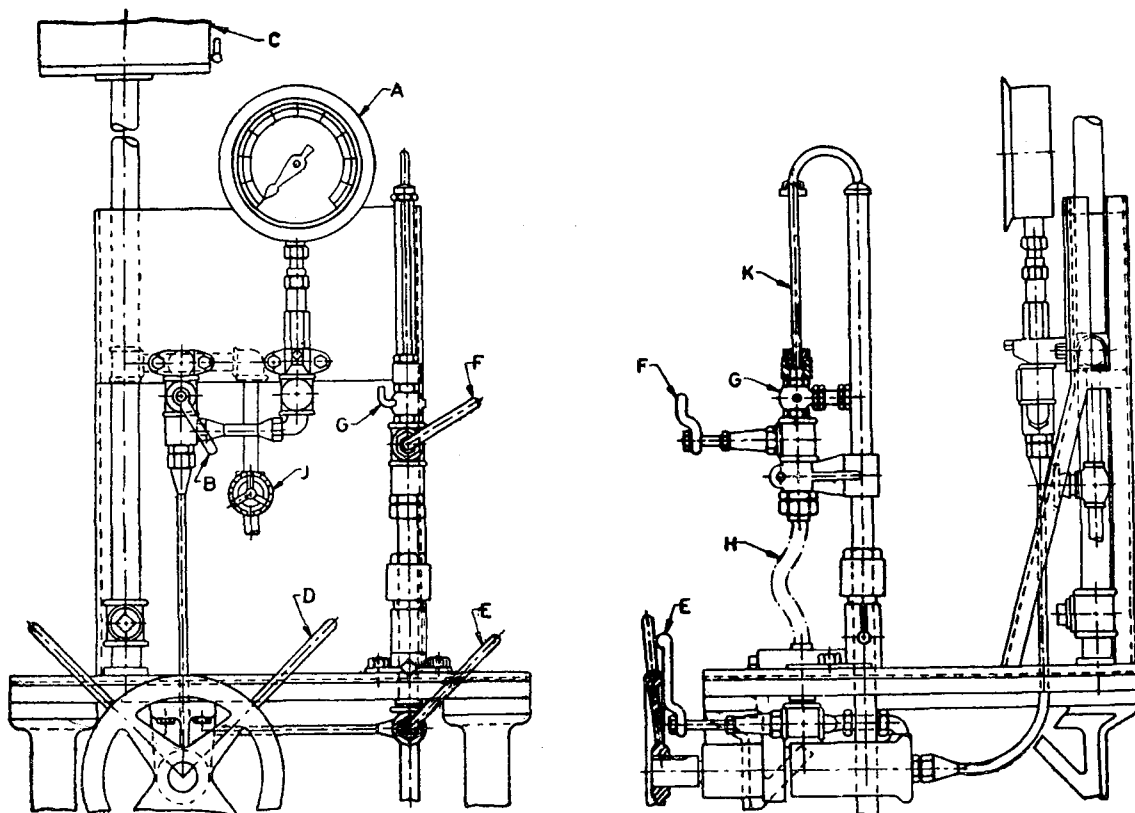


FIG. 2 APPARATUS FOR EXPANSION TEST AND BURSTING STRENGTH TEST

leaks at the connections, release the pressure in the hose completely by opening the valves. Close this valve before proceeding with the next step. Adjust the water level in burette *K* to zero by means of valve *G*. Turn crank *D* to the right until gauge *A* shows a pressure of 7 MPa. Seal this pressure in the hose by closing valve *E*, after which measure the expansion immediately by opening valve *F* and allowing the water in the expanded hose to rise in the burette. As soon as the liquid level is constant, fluid stabilization time shall be 10 ± 3 s, close valve *F* and take the reading on burette *K*. Repeat this

operation so that the final reading taken at burette *K* shall be the total of three expansions. Consider one third of this reading minus the calibration factor, as the final volumetric expansion of the hose at 7 MPa. Readjust the water level in the burette to zero as above and repeat the procedure to obtain the expansion at a pressure of 10.5 MPa. The pressure in the hose shall inadvertently be raised prior to the expansion reading to a value above the specified, do not take a reading, but instead completely release the pressure and repeat the procedure.

ANNEX C

(Clause 5.7)

METHOD FOR BURSTING STRENGTH TEST

C-1 GENERAL

The bursting strength test consists of subjecting the specimen of hydraulic brake hose to the action of internal hydrostatic pressure under specified condition.

C-2 APPARATUS

The apparatus shall consist of a suitable pressure system in which the hose is so connected that the controlled and measured fluid pressure may be applied internally. The pressure shall be obtained by means of a hand or power-driven pump or an accumulator system and shall be measured with the calibrated gauge. Provision shall be made for filling the hose with distilled water or brake fluid and allowing all air to escape through a relief valve prior to application of the pressure. This is important as a safety measure. The pressure shall be applied at a rate of increase of 175 ± 70 MPa/min. Since the hose withstands a minimum bursting pressure as

shown in Table 4, care shall be taken that all piping, valves and fitting are sufficiently rugged and adopted to a high pressure work. The apparatus described for the expansion test (*see* Annex B) may be used when it conforms to these requirements.

C-3 PROCEDURE

Connect the specimen to the pressure system and fill completely with water or brake fluid allowing all air to escape.

Removal of air bubbles may be facilitated by moving the hose back and forth. Close the relief valves and apply the pressure at the rate specified in C-2.1 until it reaches the retention pressure specified in Table 4. Hold this pressure for 2 min. At the expiry of this 'hold' period, increase the pressure until the specimen bursts. Consider the maximum pressure noted on the calibrated gauge as the bursting strength of the specimen.

ANNEX D

(Clause 5.8)

METHOD FOR WHIP TEST**D-1 GENERAL**

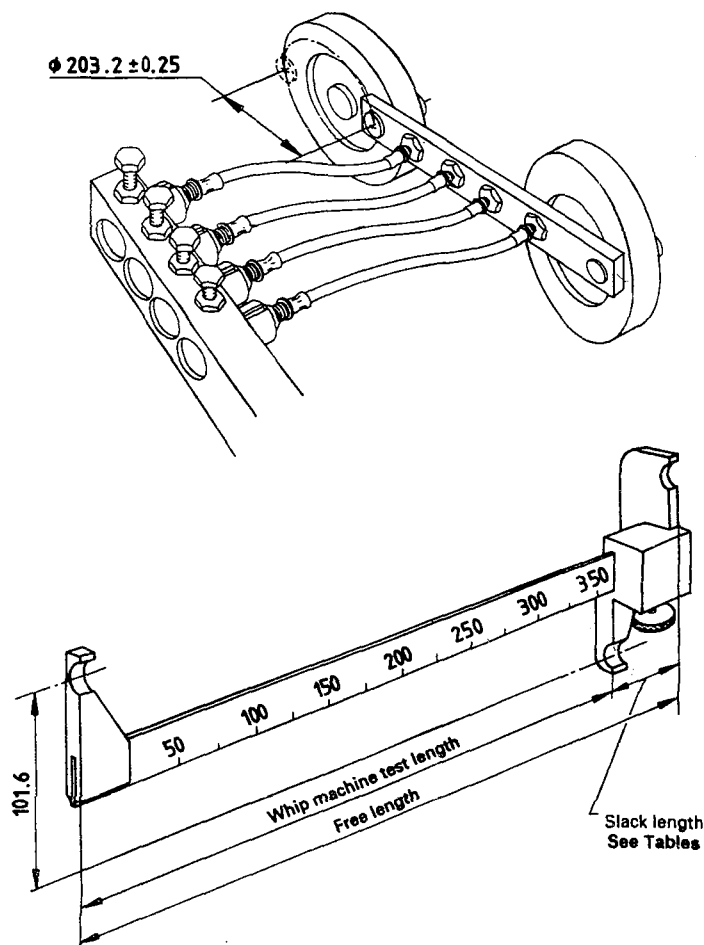
The whip test shall be designed to measure the fatigue life of the brake hose assembly. The flexing motion imparted by the test apparatus, while different from that to which the assembly is subjected in service, provides a highly accelerated method of measuring the resistance of a hose to dynamic fatigue.

D-2 APPARATUS

D-2.1 The essential features of the apparatus are a movable header consisting of a horizontal bar mounted at each end on vertically rotating disk through ball bearings with centers and an adjustable stationary header parallel to the movable header in the same horizontal plane as the center of the disks (refer Fig. 3). The headers each shall be provided with four standard end connections equally spaced, approximately 9 cm on centers in which hose assemblies are mounted in parallel. The disks shall be revolved at a speed of

800 ± 10 rpm, whereby the hose ends fastened to the moving header are rotated at this speed through a circle 20 cm in diameter, while the opposite hose ends remains stationary. The end connection on the movable header shall be tightly capped, while those on the stationary header are open to a manifold through which water pressure is supplied by means of weight operated plunger in pressure cylinder. The hose assemblies shall be thereby subjected during test to a constant water pressure which shall be maintained between 1.6 and 1.75 MPa as limit switch operated by the plunger weight shall be used to stop the machine when the water pressure drops, as in the case of failure of the hose, since it is essential that the machine stops if the pressure drops or a specimen fails. A suitable revolution counter and elapsed time indicator shall be provided.

D-2.2 Alternatively, machine capable of testing one hose at a time may also be used provided other conditions of test are maintained.



All dimensions in millimetres.

FIG. 3 WHIP TEST APPARATUS AND WHIP TEST SLACK SETTING FIXTURE

D-3 PROCEDURE

Equip the non-rotating header to permit attachment of each hose assembly with individual adjustment for length. When mounted in the whip test machine, the projected length of the hose assembly shall be less than the straight length by the amount indicated as slack in Table 7. Determine the fatigue life on specimens 200 to 600 mm for 3.5 mm or less hose and 200 to 400 mm for 4 to 5 mm hose made from the same lot of hose. Since the whip test results are very sensitive to errors, in setting this length, measurement shall be obtained with due care. The reduction from straight length to projected length on the machines shall be within the limits specified. Take the projected length parallel to the axis of the rotating head. Install the test specimen assemblies in the apparatus in their natural 'lay' that is, without any twist. Apply the water pressure and bleed all hose and passages to eliminate air pockets or

bubbles. Start the meter rotating the movable head and note the duration of the test. Failure of the specimen by water leakage through a rupture, and consequent loss of pressure terminates the test. When a minimum time requirement is specified, run the machine continuously during this period.

Table 7 Hose Lengths
(Clauses 5.8 and D-3)

Sl No.	Straight Length (Free Length Between Fittings)	Slack mm	
		3.5 or less	4 to 5
(1)	(2)	(3)	(5)
i)	Above 200 up to 400	44.45 ± 0.40	25.4 ± 0.40
ii)	Above 400 up to 480	31.75 ± 0.40	—
iii)	Above 480 up to 600	19.05 ± 0.40	—

ANNEX E

(Clause 5.11)

METHOD FOR SALT SPRAY TEST

E-1 APPARATUS

E-1.1 The apparatus required for salt spray testing consists of a fog chamber, a salt solution reservoir, a supply of suitably conditioned compressed air, one or more atomizing nozzles, specimen supports, provision for heating the chamber and necessary means of control. The size and detailed construction of the apparatus is optional provided the conditions obtained meet the requirements of this method.

E-1.2 Drops of solution which accumulates on the ceiling, or cover of the chamber shall not be permitted to fall on the specimens under testing.

E-1.3 Drops of the solution which fall from the specimens shall not be returned to the solution reservoir for respraying.

E-1.4 Material of construction shall be such as it does not affect the corrosiveness of the fog.

E-2 PREPARATION AND POSITIONING OF TEST SPECIMENS

E-2.1 Metallic and metal coated fitting shall be suitably cleaned. The cleaning method shall be optional depending on the nature of the surface and contaminants, except that it shall not include the use of abrasives other than paste of pure magnesium oxide or solvents that are corrosive or may deposit corrosive or protective films. The use of the nitric acid solution for the chemical cleaning, or passivation, of stainless steel

specimens is permissible when agreed between the manufacturer and the purchaser. Care shall be taken that specimens are not recontaminated after cleaning by excessive or careless handling.

E-2.2 The position of the hose assembly in the salt spray chamber during the test shall be such that the conditions given in **E-2.2.1** to **E-2.2.4** are met.

E-2.2.1 Unless otherwise specified, the hose assembly shall be supported or suspended between 15° and 30° from the vertical, preferably parallel to the principal direction of horizontal flow of fog through the chamber, depending on the dominant surface being tested.

E-2.2.2 The hose assemblies shall not touch each other or any metallic material or any material capable of acting as a wick.

E-2.2.3 Each specimen shall be placed in such a manner that permits free settling of fog on all specimens.

E-2.2.4 Salt solution from one specimen shall not drip on any other specimens.

NOTE — Materials suitable for the construction or coating of racks and support are glass, rubber, plastic or suitably coated wood. Bare metal shall not be used. Specimens shall preferably be supported from the bottom or the side. Slotted wooden strips are suitable for the support of flat panels. Suspension from glass hooks or waxed string may be used as long as the specified position of the specimens is obtained and if necessary, by means of secondary support at the bottom of the specimens.

E-3 SALT SOLUTION

E-3.1 The salt solution shall be prepared by dissolving 5 parts of mass of salt in 95 parts of distilled water or water containing not more than 200 ppm of total solids. The salt used shall be sodium chloride substantially free from nickel and copper and containing on the dry basis not more than 0.1 percent of sodium iodide and not more than 0.3 percent of total impurities. The pH of the salt solution shall be such that when atomized at 35°C, the collected solution shall be in the pH range of 6.5 to 7.2 (*see* Note 1). Before the solution is atomized, it shall be free from suspended solids (*see* Note 2). The pH measurement shall be made electrometrically at 27°C using a glass electrode with a saturated potassium chloride bridge; or calorimetrically using Bromothymol blue as indicator (*see* Note 3).

NOTES

1 Temperature affects the pH of a salt solution prepared from water, saturated with carbon dioxide at room temperature and pH adjustment may be made by any one of the following three methods:

- When the pH of a salt solution is adjusted at room temperature, and atomized at 35°C, the pH of collected solution shall be higher than the original solution shall be due to loss of carbon dioxide at the higher temperature. When the pH of the salt solution is adjusted at room temperature, it is necessary to adjust it below 6.5 so that the collected solution after atomizing at 35°C shall meet the pH limits of 6.5 to 7.2. Take about a 50 ml sample of the salt solution as prepared at room temperature, boil gently for 30 s, cool and determine the pH. When the pH of the salt solution is adjusted to 6.5 to 7.2 by this procedure, the pH of the atomized and collected solution at 35°C shall be within this range.
- Heating the salt solution to boiling and cooling it to 35°C or maintaining it at 35°C for approximately 48 h before adjusting the pH produces a solution, of pH value which does not materially change when atomized at 35°C.
- Heating the water from which the salt solution is prepared to 35°C or above, to expel carbon dioxide, and adjusting the pH of the salt solution with the limits of 6.5 to 7.2 produces a solution the pH of which does not materially change at atomized at 35°C.

2 The freshly prepared salt solution may be filtered or decanted before it is placed in the reservoir, or the end of the tube leading from the solution to the atomizer may be covered with a double layer of cheese cloth to prevent plugging of the nozzle.

3 The pH can also be adjusted by additions of dilute hydrochloric acid or sodium hydroxide solutions.

E-4 AIR SUPPLY

The compressed air supply to the nozzle or nozzle for atomizing the salt solution shall be free from oil and dirt (*see* Note 1) and maintained between 70 KPa and 175 KPa (*see* Note 2).

NOTES

1 The air supply shall be free from oil and dirt and can be achieved by passing it through water scrubber or at least 60 cm of suitable cleaning material, such as asbestos, sheep's wool excelsior, slag wool, or activated alumina.

2 Atomizing nozzles may have a critical pressure at which an abnormal increase in the corrosiveness of the salt fog occurs. If the critical pressure of the nozzle has not been established with certainty, control of fluctuation in the air pressure with ± 0.7 KPa can be achieved by installing suitable pressure regulator valve that minimizes the possibility of the nozzle shall be operated at its critical pressure.

E-5 CONDITIONS IN THE SALT SPRAY CHAMBER

E-5.1 Temperature

The exposure to zone of the salt spray chamber shall be maintained at $35 \pm 1^\circ\text{C}$. The temperature within the exposure zone of the closed cabinet shall be recorded at least twice a day at least 7 h apart.

NOTE—The suitable method to record the temperature is either by a continuous recording device or by a thermometer which can be read from outside the closed cabinet. The recorded temperature shall be obtained with the salt spray chamber closed to avoid a false low reading due to wet bulb effect when the chamber is open.

E-5.2 Atomization and Quality of Fog

At least two clean fog collectors shall be so placed within the exposure zone that no drops of solution from the test specimen or any other source shall be collected. The collectors shall be placed in the proximity of the test specimens, one nearest to any nozzles and the other farthest from all nozzles. The fog shall be such that for each 80 cm² of horizontal collecting area the sample collected shall be 1.0 to 2.0 ml of solution per hour based on an average run of at least 16 h (*see* Note 1). The sodium chloride concentration of the collected solution shall be 5 ± 1 percent by mass (*see* Note 2). The pH of the collected solution shall be 6.5 to 7.2. The pH measurement shall be made electrometrically or calorimetrically using bromothymol blue as the indicator.

NOTES

1 Collecting devices suitable are glass funnels with the stems inserted through stoppers into graduated cylinders, or crystallizing dishes. Funnels and dishes with a diameter of 10 cm have an area of about 80 cm².

2 A solution having a specific gravity of 1.025 5 to 1.040 0 at 27°C shall meet the concentration requirement. The concentration may also be determined as follows:

Dilute 5 ml of the collected solution to 100 ml with distilled water and mix thoroughly: put a 10 ml aliquot into an evaporating dish; and 40 ml of distilled water and 1 ml of 1 percent potassium chromate (chloride free) and titrate with 0.1N silver nitrate to the first appearance of a permanent red coloration. A solution, which requires between 3.4 and 5.1 ml of 0.1N silver nitrate, shall meet the concentration requirements.

E-5.3 The nozzle or nozzles shall be so directed or baffled that none of the spray can impinge directly on the test specimens.

E-6 CLEANING OF TESTED SPECIMENS

After carefully removing the specimens at the end of the test, these shall be treated as follows:

Specimens may be gently washed or dipped in clean running water not warmer than 40°C to remove salt spray deposit from their surface and dry them immediately. If required, remove by light brushing any corrosion of the underlying metal substratum.

ANNEX F

(Clause 5.14)

METHOD FOR DYNAMIC OZONE TEST

F-1 PREPARATION

Precondition the hose assembly in a non-stressed condition heated at $27 \pm 6^\circ\text{C}$ for at least 24 h prior to the start of the test.

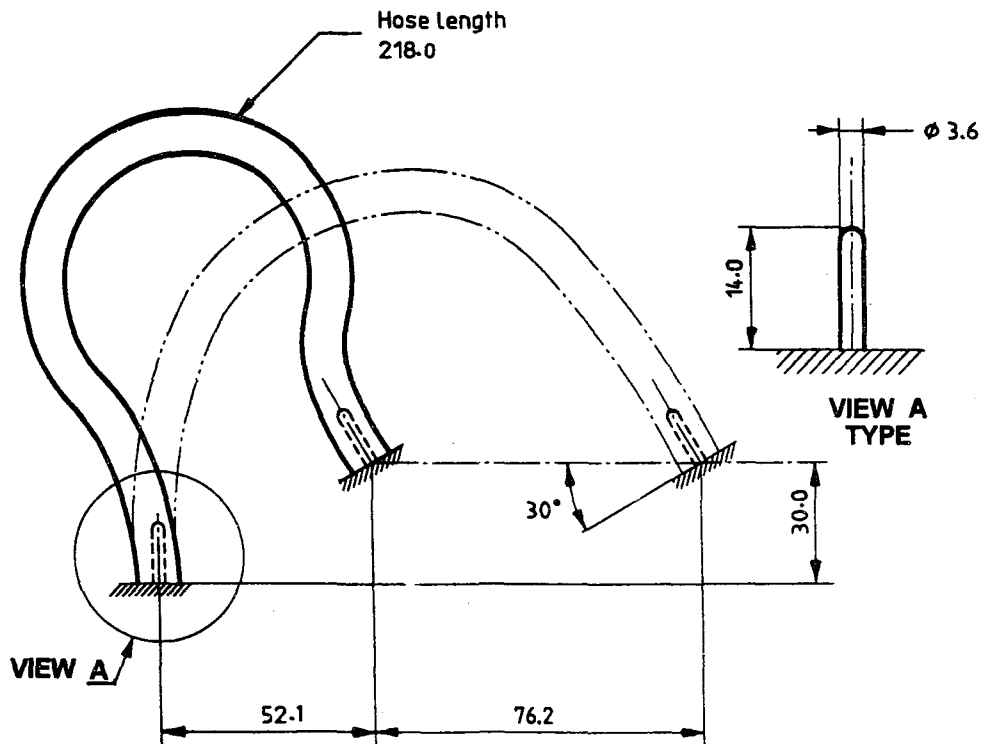
F-2 PROCEDURE

F-2.1 Assemble the hose assembly on the dynamic ozone test apparatus so that they meet the relative position and flex parameters shown in the Fig. 4. Install the hose assembly, 218 ± 3 mm long, over the fixture pins until the hose assembly has bottomed out. Use band clamps to retain the hose assembly on the pins securely.

F-2.2 Install the test apparatus and the hose assembly in a stabilized ozone chamber containing air mixed with ozone at an ozone partial pressure of 100 ± 10 MPa (100 ± 10 parts of ozone per 100 million parts of air by volume). The air temperature in the chamber shall be $40 \pm 3^\circ\text{C}$.

F-2.3 Start the cycling test when the chamber reaches the specified ozone concentration but no later than 1 h after putting the test apparatus in the chamber. The flex rate shall be 0.3 ± 0.05 Hz. The stroke shall be 76.2 ± 2.5 mm. The cycling test duration shall be 48 to 49 h.

F-2.4 Examine the outside cover of the hose assembly for cracks.



All dimensions in millimetres.

FIG. 4 OZONE STRENGTH TEST APPARATUS

ANNEX G

(Clause 5.15)

METHOD FOR HOT IMPULSE STRENGTH TEST

G-1 APPARATUS

G-1.1 The pressure cycling apparatus shall be capable of applying a pressure of 11 MPa. It shall have automatic control of the time for the pressure apply/release cycle.

G-1.2 An insulated circulating air oven with a suitable thermostatically controlled heating system is required to maintain a temperature of $143 \pm 3^\circ\text{C}$.

G-1.3 The pressure hold and burst strength test apparatus shall be as described in 5.7.

G-2 PROCEDURE

G-2.1 Connect the hose assemblies to a pressure cycling apparatus capable of producing a pressure of 0 to 11 MPa.

G-2.2 Fill the pressure cycling apparatus and hose

assemblies with IS 8654 compatible non-petroleum-base brake fluid, and bleed free of air.

G-2.3 Place the hose assemblies in a circulating air oven and within 30 min attain an oven temperature of $143 \pm 3^\circ\text{C}$.

G-2.4 Subject the hose assemblies to a cycling internal pressure of 11 to 11.5 MPa for 60 ± 6 s and then 0 MPa for 60 ± 6 s. Pressures shall be attained within 2 s. Pressure cycle the assemblies for at least 150 cycles.

G-2.5 Remove the hose assemblies from the oven. Disconnect the hose assemblies from the apparatus, and drain the fluid. Cool the hose assemblies in air at room temperature for at least 45 min.

G-2.6 Subject the hose assemblies to the pressure hold and burst test described in 5.7.

ANNEX H

(Clause 5.16)

METHOD FOR BRAKE FLUID COMPATIBILITY TEST

H-1 PREPARATION

H-1.1 Attach hose assembly or manifold to which multiple hose assemblies may be attached, below a reservoir filled, as shown in Fig. 5 with 100 ml of IS 8654 compatibility brake fluid.

H-1.2 Seal the lower end, fill the hose assembly with brake fluid, and place the test assembly in a vertical portion.

H-2 PROCEDURE

H-2.1 Condition the hose assembly at 120°C for 70 h.

H-2.2 After completion of the test period, remove the hose assembly and cool at room temperature for 30 ± 5 min.

H-2.3 Drain the brake hose and within 10 min verify the constriction requirements according to 5.16.

H-2.4 The brake hose assembly shall be tested within 3h as described in 5.16.

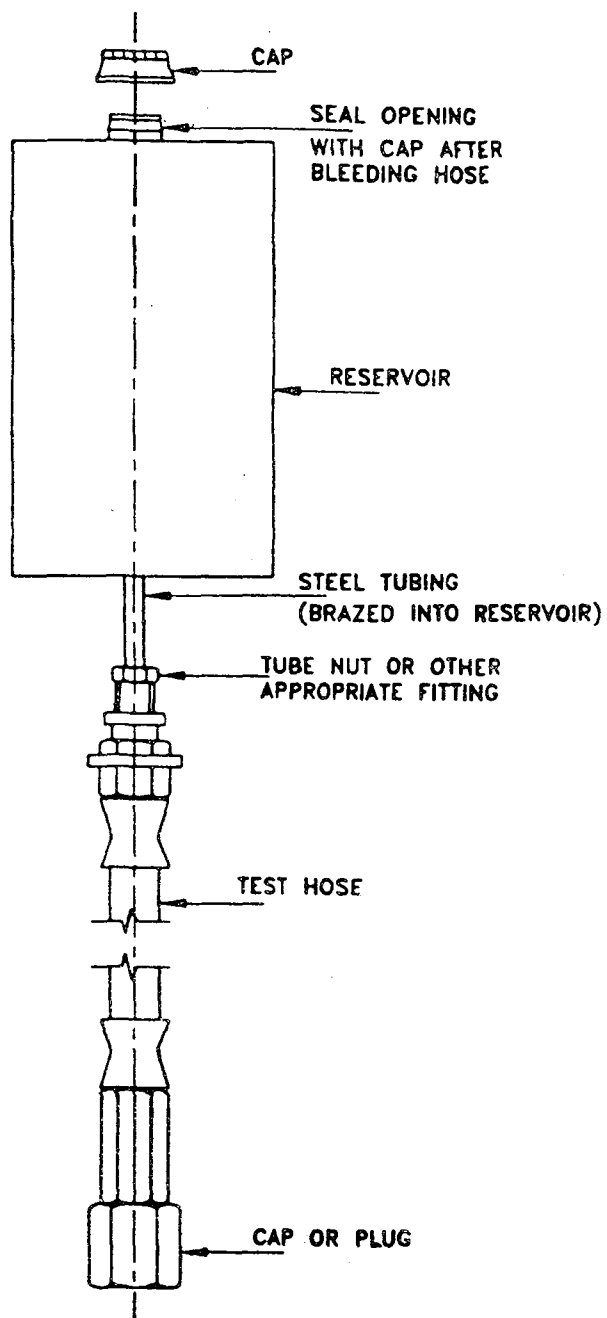


FIG. 5 BRAKE FLUID COMPATIBILITY TEST APPARATUS

ANNEX J**(Foreword)****COMMITTEE COMPOSITION****Automotive Braking Systems, Vehicle Testing and Performance
Evaluation Sectional Committee, TED 4**

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Rane Brake Linings Ltd, Chennai	SHRI S. BADRINARAYANAN SHRI L. RAMASAMY (<i>Alternate</i>)

<i>Organization</i>	<i>Representative(s)</i>
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